Beaverhead River Valley West
Ground Water Investigation Program

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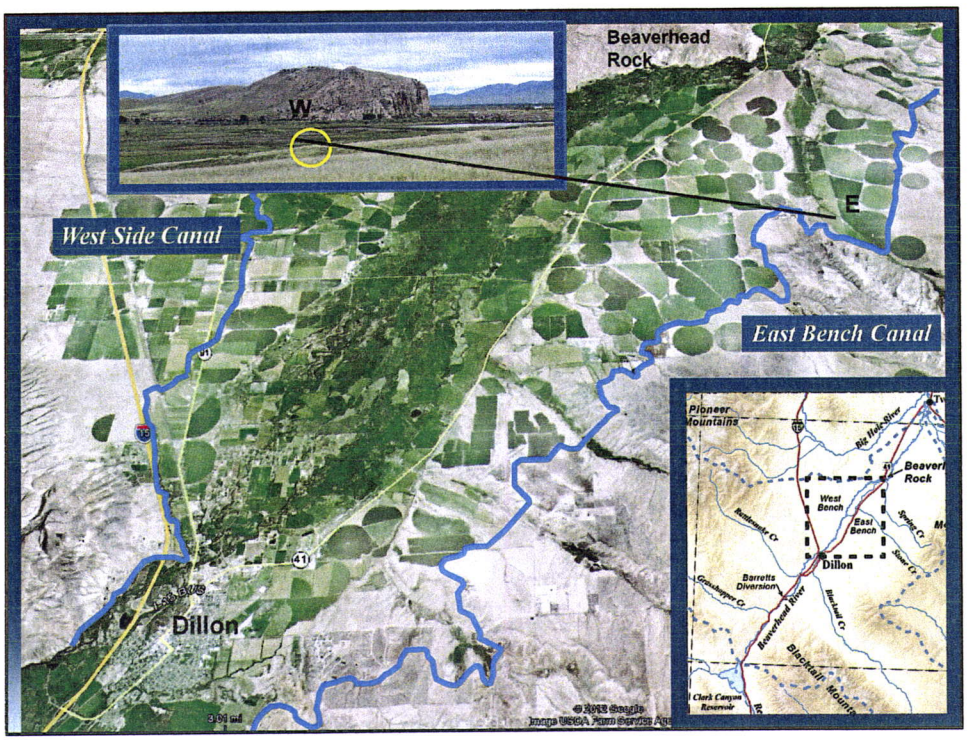
Project Purpose

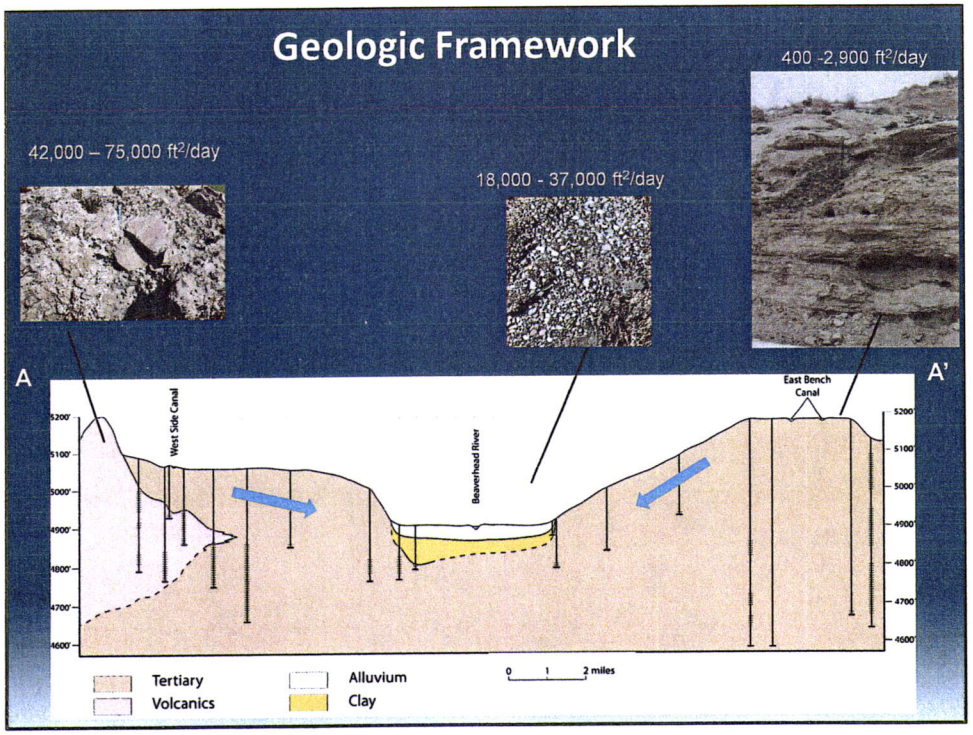
Is groundwater drawdown and stream depletion occurring due to high-capacity irrigation pumping from aquifers?

Evaluate possible impacts to sloughs and the Beaverhead River from future groundwater development.

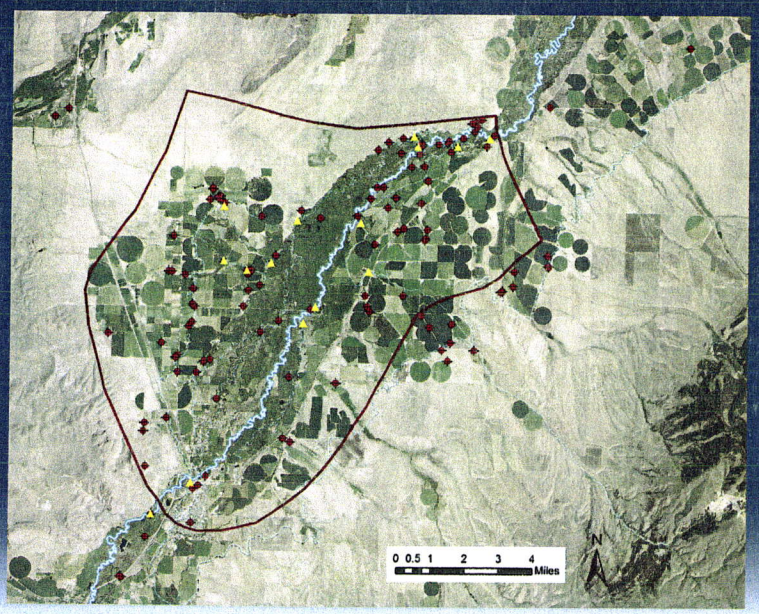
Main Objectives

- Groundwater movement and groundwater trends
- Water budget
- Quantify groundwater recharge from canals and irrigated fields
- Groundwater/surface-water interaction
- Evaluate potential stream depletion


W
E
Beaverhead Rock
West Side Canal
East Bench Canal
Dillon
Pioneer Mountains
Big Hole River
Beaverhead Rock
West Bench
East Bench
Barretts Diversion
Dillon
Beaverhead River
Blacktail Mountains
Clark Canyon Reservoir

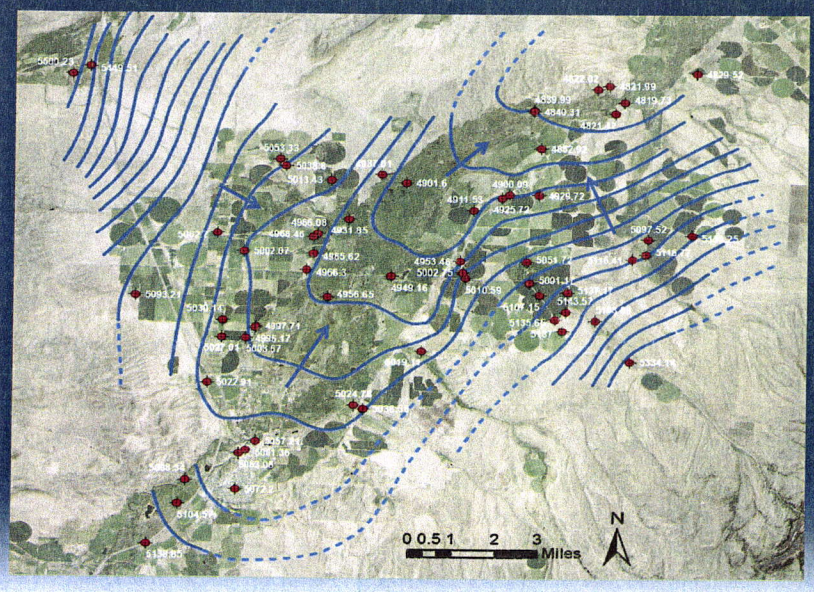

Geologic Framework
42,000 – 75,000 ft²/day
18,000 - 37,000 ft²/day
400 -2,900 ft²/day
A
A'
West Side Canal
Beaverhead River
East Bench Canal
5200'
5100'
5000'
4900'
4800'
4700'
4600'
Tertiary
Volcanics
Alluvium
Clay
0 1 2 miles

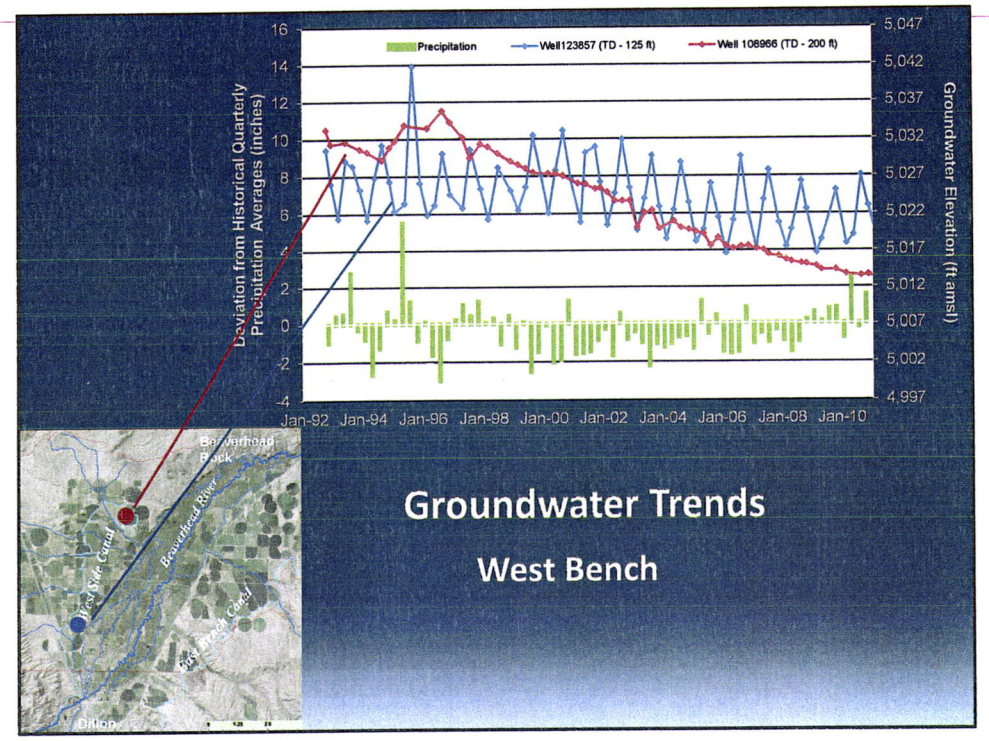
Monitoring Network

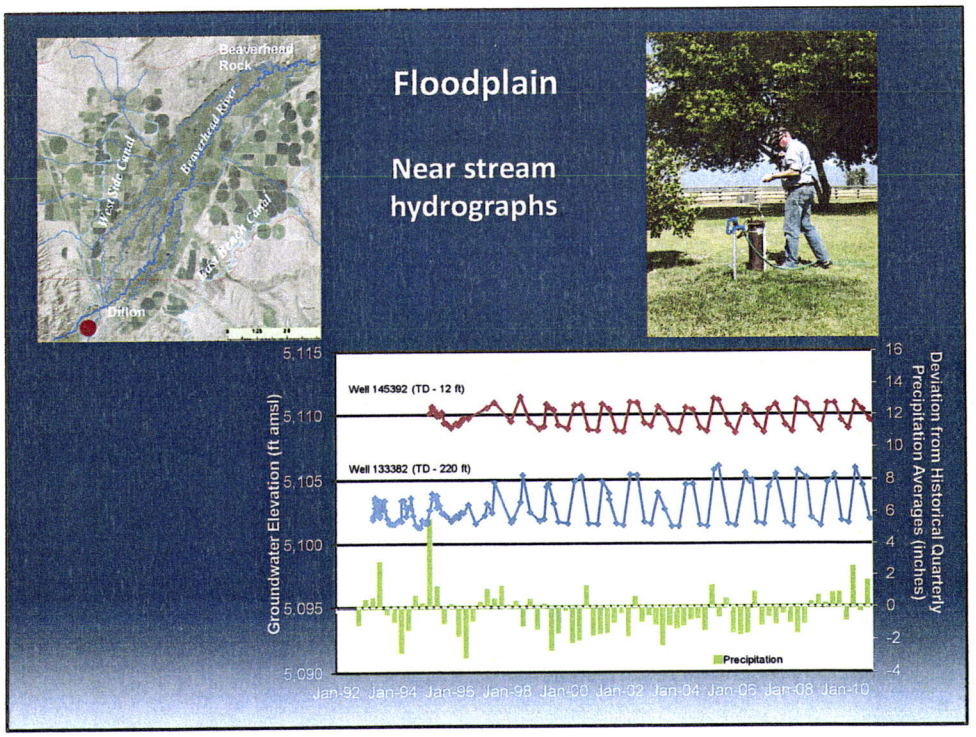


Groundwater Movement

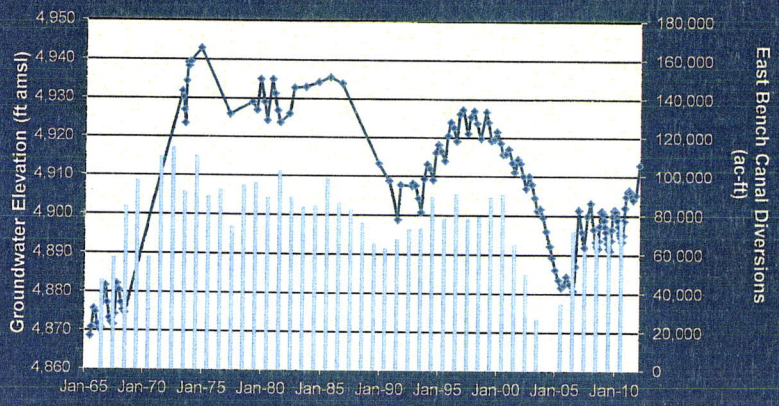
Tertiary Aquifer



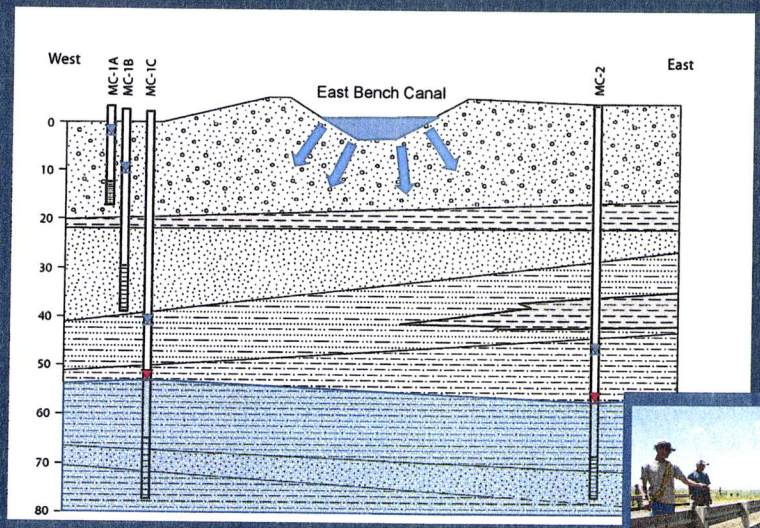

Precipitation
Well123857 (TD - 125 ft)
Well 108966 (TD - 200 ft)
Deviation from Historical Quarterly Precipitation Averages (inches)
Groundwater Elevation (ft amsl)
Jan-92 Jan-94 Jan-96 Jan-98 Jan-00 Jan-02 Jan-04 Jan-06 Jan-08 Jan-10
Beaverhead Rock
Beaverhead River
West Side Canal
East Bench Canal
Dillon
Groundwater Trends
West Bench

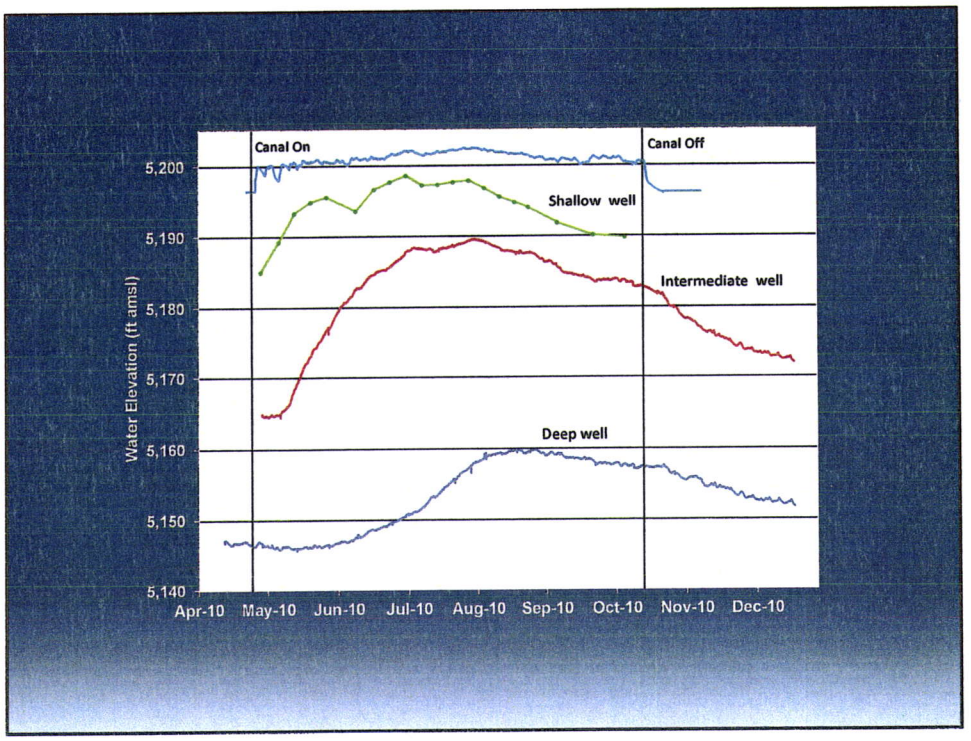

Beaverhead Rock
Beaverhead River
West Side Canal
East Bench Canal
Dillon
Floodplain
Near stream hydrographs
Well 145392 (TD - 12 ft)
Well 133382 (TD - 220 ft)
Precipitation
Groundwater Elevation (ft amsl)
Deviation from Historical Quarterly Precipitation Averages (inches)
Jan-92 Jan-94 Jan-96 Jan-98 Jan-00 Jan-02 Jan-04 Jan-06 Jan-08 Jan-10

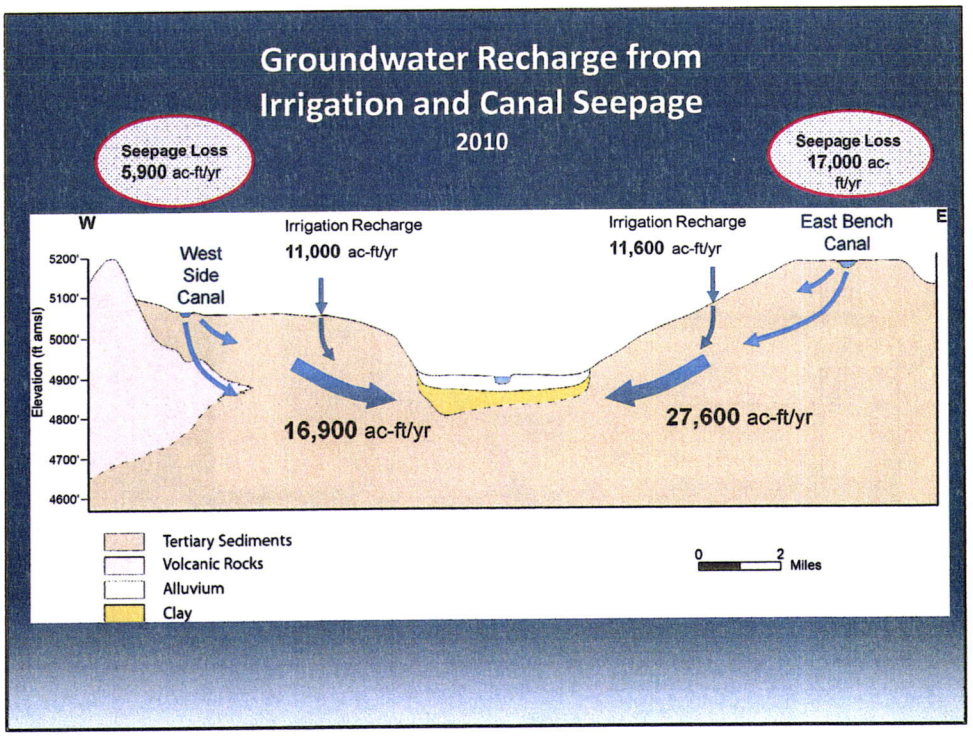
East Bench

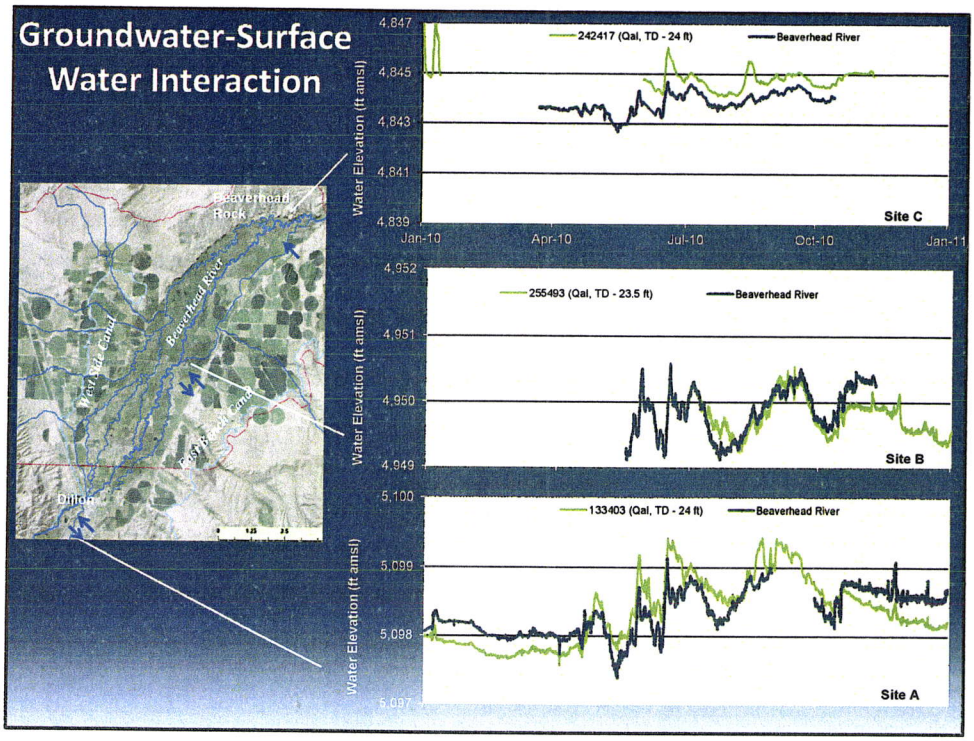


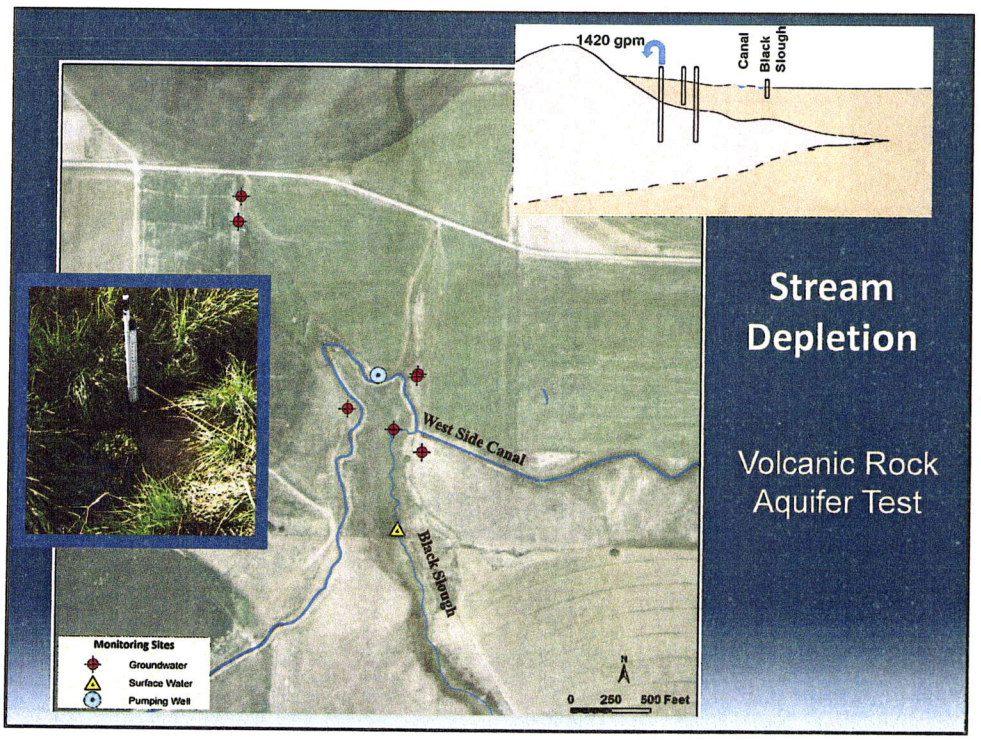
Canal Seepage




Canal On
Canal Off
Shallow well
Intermediate well
Deep well
Water Elevation (ft amsl)
5,200
5,190
5,180
5,170
5,160
5,150
5,140
Apr-10
May-10
Jun-10
Jul-10
Aug-10
Sep-10
Oct-10
Nov-10
Dec-10


Groundwater Recharge from Irrigation and Canal Seepage
2010
Seepage Loss 5,900 ac-ft/yr
Seepage Loss 17,000 ac-ft/yr
W
E
Irrigation Recharge 11,000 ac-ft/yr
Irrigation Recharge 11,600 ac-ft/yr
West Side Canal
East Bench Canal
Elevation (ft amsl)
5200'
5100'
5000'
4900'
4800'
4700'
4600'
16,900 ac-ft/yr
27,600 ac-ft/yr
Tertiary Sediments
Volcanic Rocks
Alluvium
Clay
0
2
Miles


Groundwater-Surface Water Interaction
Beaverhead River
Dillon
Water Elevation (ft amsl)
242417 (Qal, TD - 24 ft)
Beaverhead River
Site C
255493 (Qal, TD - 23.5 ft)
Site B
133403 (Qal, TD - 24 ft)
Site A
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11


1420 gpm
Canal
Black Slough
Stream Depletion
Volcanic Rock Aquifer Test
West Side Canal
Black Slough
Monitoring Sites
Groundwater
Surface Water
Pumping Well
0 250 500 Feet

Confined or Unconfined????
102 ft of clay!!

Section 7: Well Test Data

Total Depth: 200
Static Water Level: 10.5
Water Temperature:

Pump Test *

Depth pump set for test: 120 feet
1500 gpm pump rate with _ feet of drawdown after 8 hours of pumping
Time of recovery: 24 hours
Recovery water level: 10.5 feet
Pumping water level: 13 feet

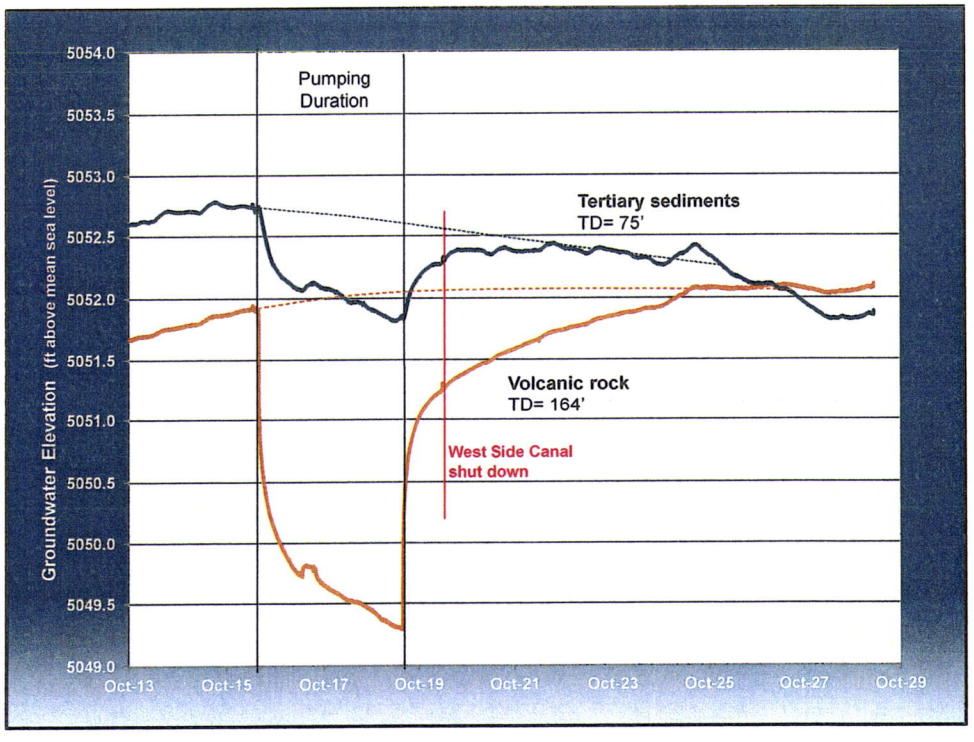
* During the well test the discharge rate shall be as uniform as possible. This rate may

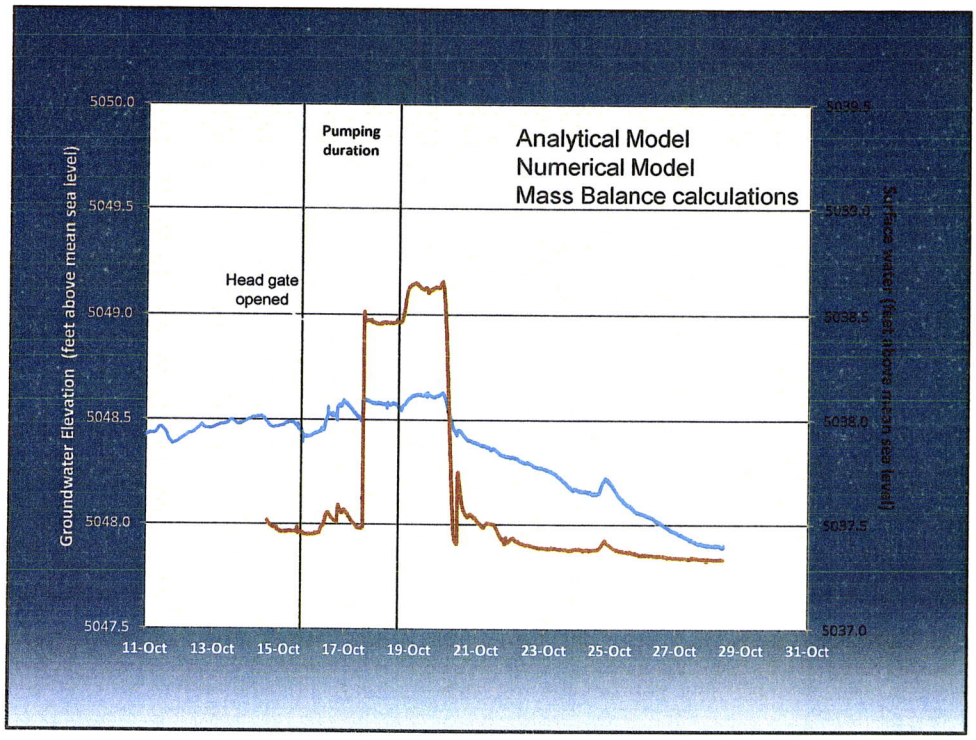
Section 8: Remarks

Section 9: Well Log
Geologic Source
120VLCC - VOLCANICS (TERTIARY)

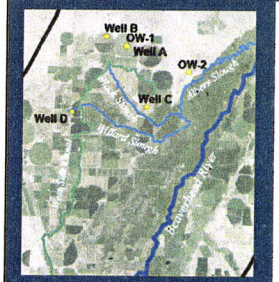
From	To	Description
0	3	TOPSOIL
3	105	CLAY
105	200	BASALT BEDROCK

Driller Certification
All work performed and reported on this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge

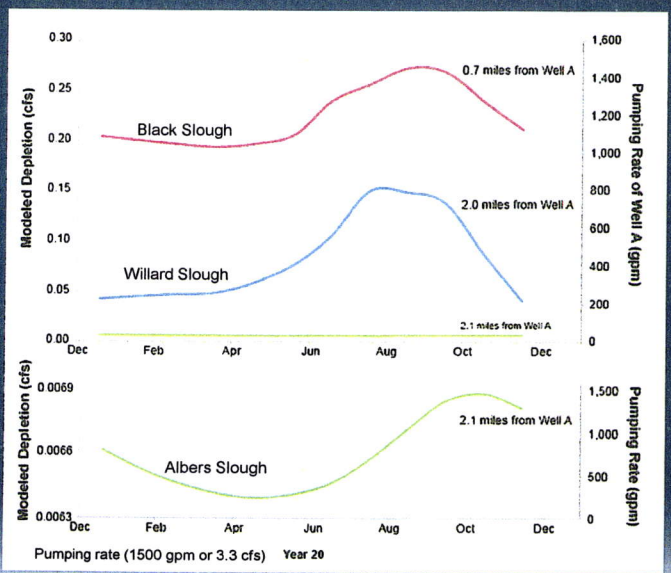




Numerical Groundwater Flow Modeling

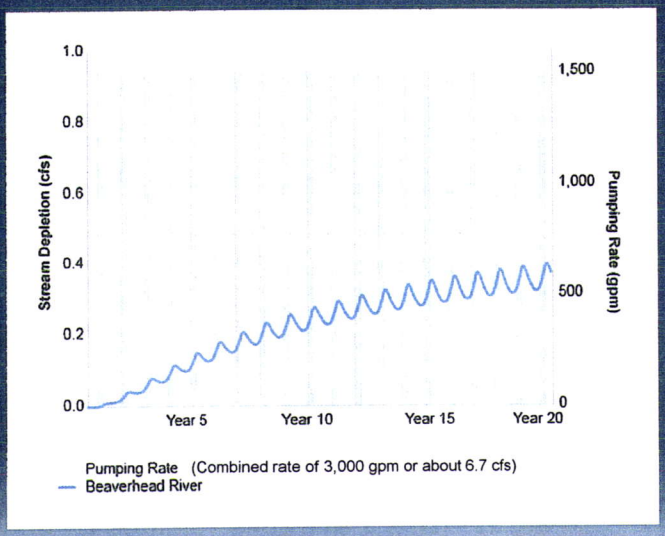


A prediction tool

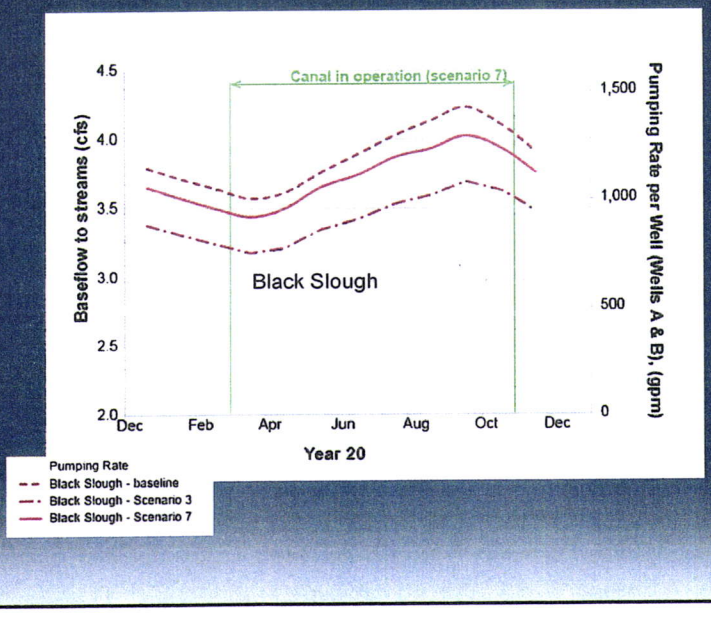


Beaverhead River

Pumping two wells in the Volcanic Rock Aquifer



Mitigating with additional canal seepage



Summary

- Defined the main aquifers
- Groundwater trends showed no observable long-term pumping effects
- Precipitation is the major inflow and ET is the major outflow
- Irrigation water and canal seepage are a significant source of groundwater recharge
- Groundwater and surface water interact along the Beaverhead River, irrigation return flows recharge the sloughs and the river
- Stream effects were observed during an aquifer test and groundwater modeling indicated long-term impacts

Project report

Acknowledgements